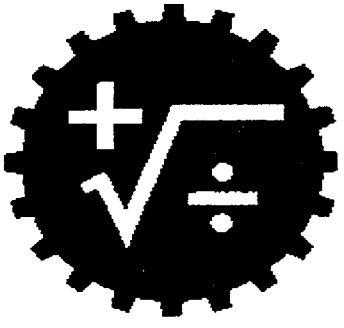
Assessment Annotations
for the Curriculum Frameworks

Mathematics

Grades 4, 8, and 10



Missouri Department of Elementary and Secondary Education
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MATHEMATICS- ASSESSMENT ANNOTATIONS

For The

Mathematics Curriculum Frameworks

The attached document provides supplemental assessment information to *Missouri's Framework for Curriculum Development in Mathematics K-12*. Contained within this assessment supplement are annotations that should be useful in understanding state and local responsibilities in assessing curriculum at the fourth, eighth, and tenth grade levels. This document indicates appropriate content and process specifications that should be useful in establishing curricula that prepares students to be proficient in mathematics.

Since the fourth and eighth grade benchmarks were established by the Framework's design, the column labeled, "What Students Should Know," establishes content that is appropriate for state testing. In addition, at the fourth, and eighth grade, the column labeled "What Students Should Be Able To Do" indicates appropriate processes for assessment. The last column labeled "Assessment Notes" further clarifies whether these processes are best assessed at the state or local level. If the phrase " Grade (4 or 8) state assessment" is shown'then this indicates that this process may be tested on the state mathematics examination at the indicated grade level.

Because benchmarks were not explicitly indicated at the tenth grade, the assessment notes provide information for both the "To Know" and "To Do" columns. The assessment notes indicate whether the content and processes are appropriate for assessment at the tenth grade on the state examination. Under the " Know" and "Do" categories in the assessment notes column, if the notation "Grade 10 state assessment" is indicated then this identifies content and processes that may be assessed at the state level. Under the " Do" of the assessment notes, process items are classified on whether these are assessed at the state level or better assessed at the local level. The notation "Beyond 10th grade state assessment" indicates material that students may or may not have covered at this point and therefore is not tested at the state level.

All of the benchmarks that were identified by the notation, "Grade (4, 8, or 10) state assessment," will not necessarily appear on a state test in any given year. The number of test items developed to access mathematical content and processes may vary from year-to-year. Only Framework pages that required assessment notes are provided within this document which results in the skipping of some page numbers.

X. Discrete Mathematics

What All Studonts Should Know	What All Students Should Be Able To Do	Fourth Grade Assessment Notes
By the end of grade 4, all students should know 1. Numbers in sequence to count objects. 2. Definition of "more" and "fewer." 3. Definition of "same" and "different." 4. Definition of "shortest" and "longest."	NOTE: Each item in this column is designed to address several elements of "what all students should be able to do." **By the** *end of grade* 4, *all students should be able to* a. determine what should be counted in a set of objects and actually count the objects (NCTM Standard 6; MO 1.8) b. predict whether the set contain more or fewer of one subset than the other (NCTM Standard 6; MO 2.2) c. illustrate or explain how the subsets of objects are the same or different (NCTM Standard 3; MO 1.8) d. identify and discuss overlapping subsets of objects (Venn diagrams) (NCTM Standard 3; MO 2.2) e. create algorithms based on constructing meaning from explorations (NCTM Standards 7 and 8; MO 1.6, 3.4, 3.6)	Do a. Grade 4 state assessment b. Grade 4 state assessment c. Grade 4 state assessment d. Grade 4 state assessment e. Local assessment

X. Discrete Mathematics

What All Students Should Know	What All Students Should Be Able To Do	Fourth Grade Assessment Notes
	f. determine a path through a maze, whether a street network could be traveled going over each street one time, and the shortest distance traveling on a network of roads or streets (NCTM Standard 9; MO 2.2, 3.3, 3.4)	Do f. Grade 4 state assessment
	g. apply the concept of *fair division* to real-world situations (NCTM Standard 1; MO 2.2, 3.2, 3.3, 3.4, 3.7) **fair division:* the division of an object (such as food among children or an estate among heirs) in a fair way for all people involved.	g. Grade 4 state assessment

X. Discrete Mathematics

What All Students Should Know	What All Students Should Be Able To Do	Eighth Grade Assessment Notes
By the end of grade 8, all students should know	NOTE: Each item in this column is designed to address several elements of "what all students should be able to do."	
1. Definition and example of patterns.	*By the end of grade 8, all students should be able to*	
2. Definition and example of tree diagrams.	a. determine and continue a pattern using inductive reasoning (NCTM Standard 3; MO 1.6, 1.8, 3.5, 4.1)	Do a. Grade 8 state assessment
3. Definition and examples of Venn diagrams.	b. look at if-then relationships to make logical deductions (NCTM Standard 3; MO 1.6, 3.5, 4.1)	b. Grade 8 state assessment c. Grade 8 state assessment
4. Definition and examples of networks.	c. investigate tree, Venn, or student-developed diagrams as an organizing tool for problem solving (NCTM Standard 3; MO 1.8, 2.1, 2.2)	d. Grade 8 state assessment
	d. explore transportation networks (NCTM Standards 2, 4, and 12; MO 2.2, 3.2, 3.3, 3.6)	

X. Discrete Mathematics

What All Students Should Know	What All Students Should Be Able To Do	Tenth Grade Assessment Notes
	e. investigate the concepts of *game theory** (NCTM Standard 1; MO 3.2, 3.7, 3.8) **game theory*: selecting the best strategies in order to achieve the most favorable outcomes. Games are defined as having two or more players with conflicting interests. f. explore concepts from election theory (NCTM Standard 1; MO 3.2, 3.7, 4.2, 4.3) g. investigate different approaches to apportionment and fair division, then explore their applications (e.g., division of property in estates, apportionment in the House of Representatives) (NCTM Standard 1; MO 3.2, 3.3, 3.7, 4.3) h. use the concept of recursion in mathematics to solve application problems (e.g., compound interest, depreciation, radium decay, maximum storage in the least amount of space, fractals) (NCTM Standard 12; MO 1.8, 2.2, 3.2, 3.7)	Do e. Beyond 10"' grade state assessment f. Beyond 10" grade state assessment g. Beyond 10th grade state assessment h. Grade 10 state assessment

X. Discrete Mathematics

What All Students Should Know

By the end of grade 12, all students should know

1. Concepts of geometry.
2. Concepts of lwobability and statistics.
3. Characteristics of exponential growth.
4. Cause-and-eifect.
5. Whole-to-part.

What All Students Should Be Able To Do

NOTE: Each item in this column is designed to address several elements of "what all students should be able to do."

By the end of grade 12, all students should be able to

a. explore and solve application problems involving graph theory (airline routes, circuits, paths, connecting roads, coloring a map, etc.) (NCTM Standard 12; MO 1.6, 1.8, 2.2, 3.2, 3.3, 3.6)

b. use tree, Venn, or student-developed diagrams as problem-solving tools (NCTM Standard 12; MO 3.2, 3.3, 3.6)

c. use concepts from logic and/or truth tables to recognize valid and invalid arguments (NCTM Standard 3; MO 2.2, 3.5)

d. explore applications from counting techniques such as Pascal's Triangle, permutations, combinations, and Fibonacci sequence (NCTM Standard 12; MO 1.6, 2.2, 3.6)

Tenth Grade Assessment Notes

Know	Do
1. Grade 10 state assessment	a. Grade 10 state assessment
2. Grade 10 state assessment	b. Grade 10 state assessment
3. Grade 10 state assessment	c. Grade 10 state assessment
4. Grade 10 state assessment	d. Grade 10 state assessment
5. Grade 10 state assessment	